



**QUEEN'S  
UNIVERSITY  
BELFAST**

## Using Machine Descriptors to Select Parallelization Models and Strategies on Hierarchical Systems

Yankelevsky, M., Ko, W., Nikolopoulos, D., & Polychronopoulos, C. D. (2001). *Using Machine Descriptors to Select Parallelization Models and Strategies on Hierarchical Systems: Supercomputing'2001: High Performance Computing and Networking Conference (SC)*. Poster session presented at Supercomputing'2001: High Performance Computing and Networking Conference (SC), Denver, CO, United States.

**Queen's University Belfast - Research Portal:**

[Link to publication record in Queen's University Belfast Research Portal](#)

### **General rights**

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact [openaccess@qub.ac.uk](mailto:openaccess@qub.ac.uk).

## Using Machine Descriptors to Select Parallelization Models and Strategies on Hierarchical Systems

Mark Yankelevsky, Walden Ko, Dimitrios S. Nikolopoulos, and  
Constantine Polychronopoulos, CSRD/University of Illinois

### Abstract:

Clusters present the programmer with a complex hierarchy of hardware components, exploiting different levels of parallelism. The optimal parallelization strategy depends on several parameters, such as the number of nodes, processors per node, memory and communication bandwidth, and the overhead of orchestrating parallelism. A compiler using a detailed machine descriptor and static performance analysis can automate the selection of the best strategy. Experiments with the NAS benchmarks (parallelized using a combination of MPI and OpenMP) revealed performance patterns that drive the selection. Results and derived algorithms are presented in the poster and incorporated into the machine description of the PROMIS ([HTTP://promis.csr.d.uiuc.edu](http://promis.csr.d.uiuc.edu)) compiler.